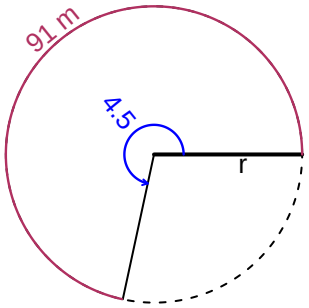
Name: Date:

Trig Final (SLTN v652)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 91 meters. The angle measure is 4.5 radians. How long is the radius in meters?

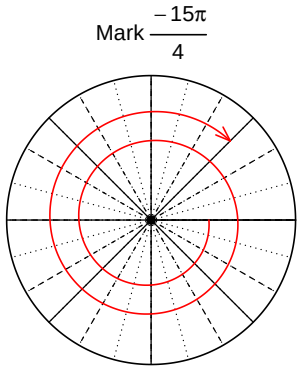


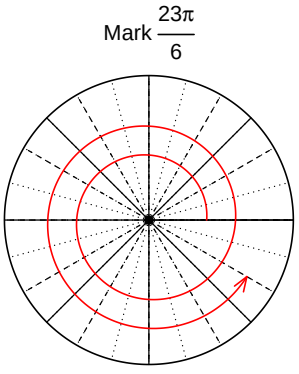
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 20.22$ meters.

Question 2

Consider angles $\frac{-15\pi}{4}$ and $\frac{23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-15\pi}{4}\right)$ and $\cos\left(\frac{23\pi}{6}\right)$ by using a unit circle (provided separately).





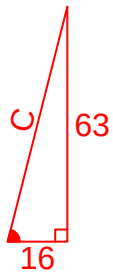
$\sin(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(23\pi/6) = \frac{\sqrt{3}}{2}$

Question 3

If $\tan(\theta) = \frac{-63}{16}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

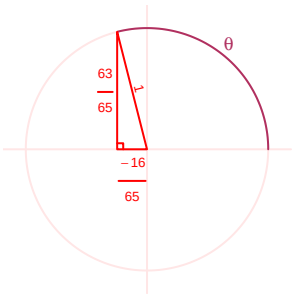
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$16^2 + 63^2 = C^2$$
$$C = \sqrt{16^2 + 63^2}$$
$$C = 65$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{63}{65}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 8.95 Hz, a midline at $y = -7.53$ meters, and an amplitude of 6.13 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 6.13\cos(2\pi 8.95t) - 7.53$$

or

$$y = 6.13\cos(17.9\pi t) - 7.53$$

or

$$y = 6.13\cos(56.23t) - 7.53$$